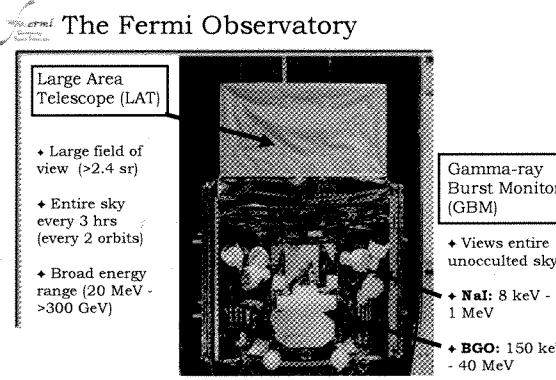


## Short-term Variability Studies of the Crab with the Fermi-LAT

Elizabeth Hays  
(NASA/GSFC)  
on behalf of the Fermi-LAT Collaboration



## The Fermi Observatory

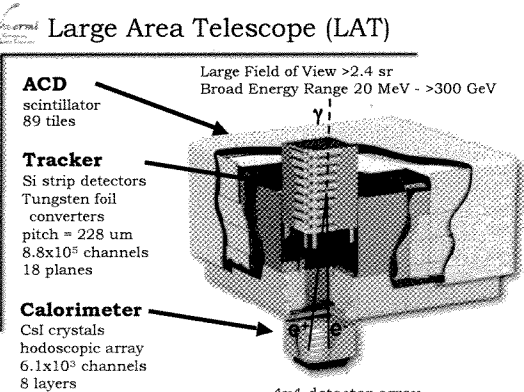
### Large Area Telescope (LAT)

- Large field of view ( $>2.4$  sr)
- Entire sky every 3 hrs (every 2 orbits)
- Broad energy range (20 MeV -  $>300$  GeV)

### Gamma-ray Burst Monitor (GBM)

- Views entire unocculted sky
- NaI**: 8 keV - 1 MeV
- BGO**: 150 keV - 40 MeV

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## Large Area Telescope (LAT)

Large Field of View  $>2.4$  sr  
Broad Energy Range 20 MeV -  $>300$  GeV

### ACD

scintillator  
89 tiles

### Tracker

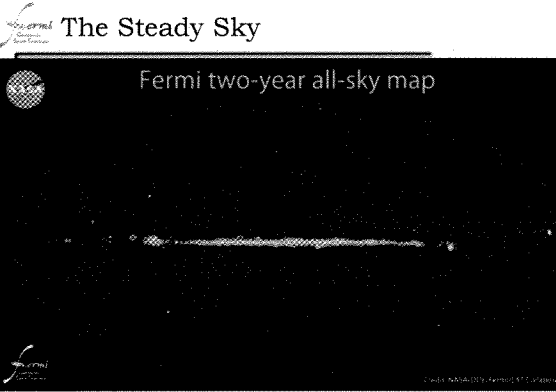
Si strip detectors  
Tungsten foil converters  
pitch = 228  $\mu$ m  
 $8.8 \times 10^5$  channels  
18 planes

### Calorimeter

CsI crystals  
hodoscopic array  
 $6.1 \times 10^5$  channels  
8 layers

4x4 detector array

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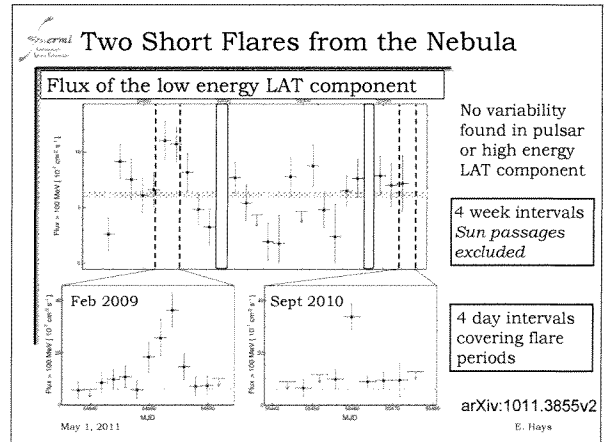
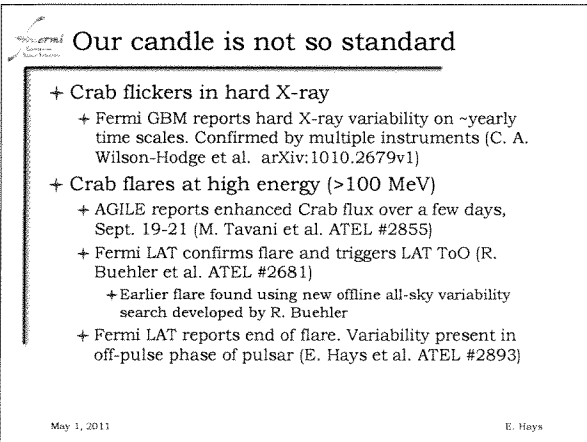
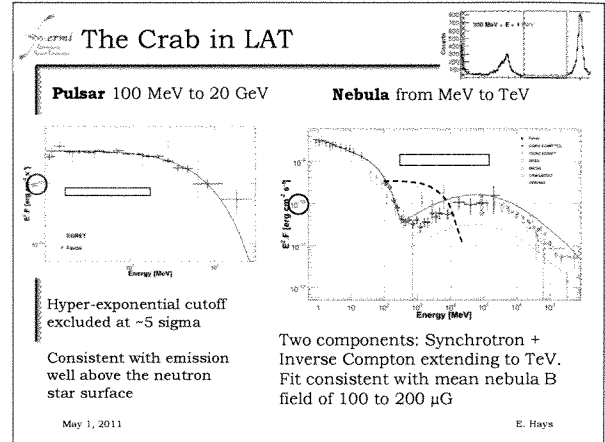
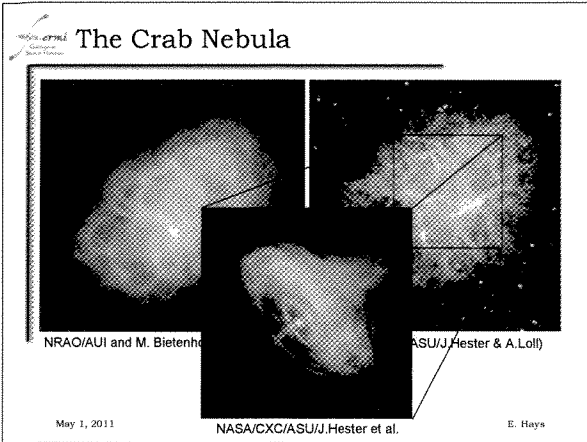


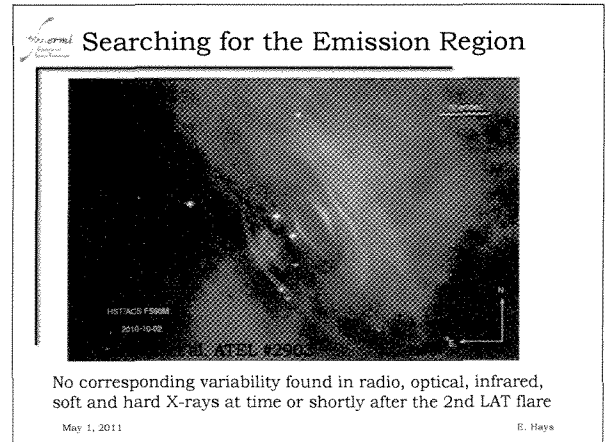
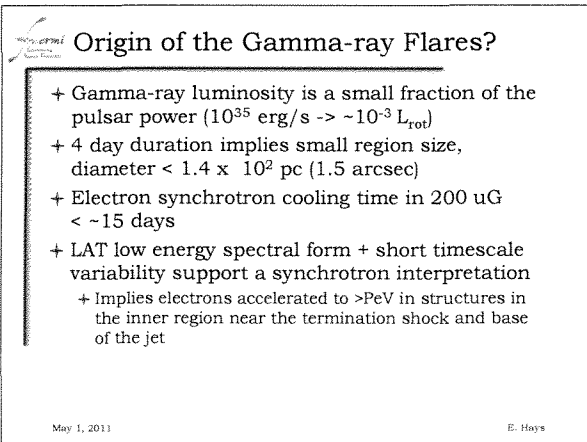
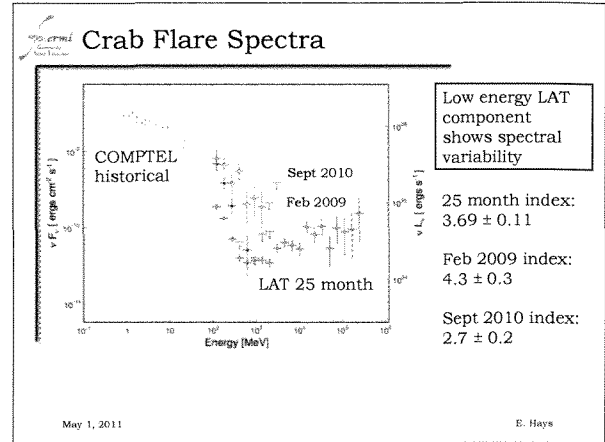
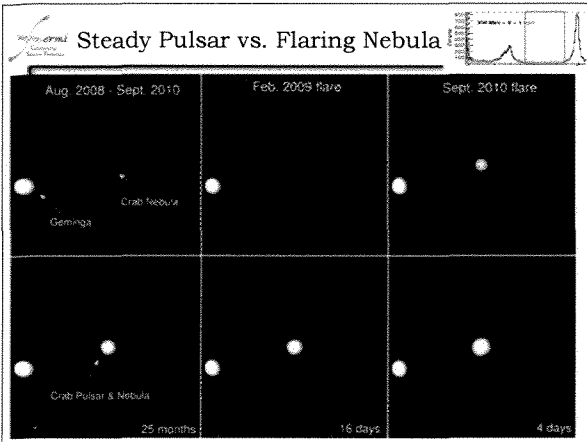
## The Steady Sky


### Fermi two-year all-sky map

$>1$  GeV

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+ Short GeV flares observed from the Crab raise interesting questions about the acceleration of electrons to surprisingly high energy in the nebula. Abdo et al. (2011, *Science*, 331, 739) use four-day intervals to evaluate flares detected in February 2009 and September 2010. That binning is well-suited to reliably detecting the flaring nebula in an off-pulse selection, avoiding the bright foreground of the pulsar which cannot be spatially separated. Alternatively, the combined pulsar and nebula flux can be used to search for additional structure within the flare as reported in Balbo et al. (2011, *A&A*, 527, L4). However, this brings in additional systematic errors due to the complexity of the combined emission and the notably soft index of the synchrotron component of the nebula. In order to accurately assess variability on shorter intervals, the systematic errors inherent in analyzing the total flux from the pulsar and nebula must be characterized. This work examines sources of systematic errors in the analysis of the combined Crab flux and their impact on variability studies using intervals shorter than four days.

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## Summary

- + Crab shows variability within flares
  - + Systematics under control
  - + Brevity of flare already strong constraint on size of emission region
  - + Watching for future activity to invoke LAT pointing and trigger MW activities to probe emission mechanism

<http://fermi.gsfc.nasa.gov>

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